CLAIMS

1. A process for producing a single crystal of a compound semiconductor, comprising bringing a molten raw material liquid into contact with a seed crystal accommodated in a lower section of a crucible and gradually cooling the molten raw material liquid in the crucible so that solidification of the raw material liquid proceeds upward, thereby growing a single crystal, wherein the seed crystal has a diameter which is 0.50 to 0.96 times that of a constant-diameter portion of the single crystal, and a diameter-increasing portion of the single crystal has a diameter increased during growth of the single crystal such that a peripheral wall of the diameter-increasing portion is inclined at 5° or more and less than 35° with respect to a crystal growth direction, followed by growth of a constant-diameter portion of the single crystal.

2. The process for producing a compound semiconductor single crystal according to claim 1, wherein the seed crystal has an average dislocation density of less than 10,000 dislocations/cm^2.

3. The first or second mentioned process for producing a compound semiconductor single crystal according to claim 1 or claim 2, wherein the seed crystal has a diameter of at

least 50 mm.

4. The process for producing a compound semiconductor single crystal according to any one of claims 1 to 3, wherein the constant-diameter portion has a diameter of at least 75 mm.

5. The process for producing a compound semiconductor single crystal according to any one of claims 1 to 4, wherein the diameter-increasing portion has a length of 20 to 100 mm as measured in the crystal growth direction.

6. The processes for producing a compound semiconductor single crystal according to any one of claims 1 to 5, wherein the compound semiconductor is a GaAs or InP semiconductor.

7. A single crystal of a compound semiconductor produced through the process for producing a compound semiconductor single crystal as recited in any one of claims 1 to 6, wherein the compound semiconductor single crystal has an average dislocation density of less than 5,000 dislocations/cm^2.

8. The compound semiconductor single crystal according to claim 7, wherein the compound semiconductor is a GaAs or InP semiconductor.

9. A crucible for growing a single crystal which is employed for a compound semiconductor single crystal growth process in which a molten raw material liquid is brought into contact with a seed crystal accommodated in a lower section of a crucible, and the molten raw material liquid is gradually cooled in the crucible so that solidification of the raw material liquid proceeds upward, to thereby grow a single crystal, the crucible comprising a seed crystal accommodation section; a diameter-increasing section which is provided atop the seed crystal accommodation section and which has an outer wall inclined at 5° or more and less than 35° with respect to a crystal growth direction; and a constant-diameter section provided atop the diameter-increasing section, wherein the seed crystal accommodation section has an inner diameter which is 0.50 to 0.96 times that of the constant-diameter section.

10. The crucible for growing the single crystal according to claim 9, wherein the seed crystal accommodation section has an inner diameter of at least 50 mm.

11. The crucible for growing a single crystal according to claim 9 or 10, wherein the constant-diameter section has a diameter of at least 75 mm.

12. The crucible for growing a single crystal according to any one of claims 9 to 11, wherein the diameter-increasing section has a length of 20 to 100 mm.